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|---|
| COLLINS, CYNTHIA E |

| ART UNIT | PAPER NUMBER |
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| 1638 | 11 |

DATE MAILED: 06/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Applicati n No. 09/854,122 | Applicant(s) ALBERTE ET AL. | |
|---|---|---|---|
| | Examin r Cynthia Collins | Art Unit 1638 | |

*-- The MAILING DATE f this communication appears n the c ver she t with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *07 April 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *10,12 and 16-19* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9, 11, 13-15, 20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *May 10, 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

### *Election/Restrictions*

Applicant's election without traverse of Group I, claims 1-15 and 20, drawn to a transgenic plant and a nucleic acid, and Invention A, drawn to a nucleotide sequence encoding a sulfotransferase, in Paper No. 10, is acknowledged. Because claims 10 and 12 are clearly not drawn to a nucleotide sequence encoding a sulfotransferase, they are withdrawn from consideration as being directed to nonelected inventions (a nucleotide sequence encoding a phenylalanine ammonium lyase, a nucleotide sequence encoding a cinnamate 4-hydroxylase, and a nucleotide sequence encoding an alcohol dehydrogenase). Claims 16-19 are also withdrawn from consideration as being directed to nonelected inventions. Claims 1-9, 11, 13-15 and 20 are examined on the merits in the instant office action.

### *Specification*

The abstract of the disclosure is objected to because it is not commensurate in scope with the elected invention. Correction is required. See MPEP § 608.01(b).

### *Claim Objections*

Claim 7 is objected to because it recites the enzymatic activities of nonelected inventions. Appropriate correction is required.

Claim 20 is objected to because it depends from a claim directed to a nonelected invention. Appropriate correction is required.

Claim 8 is objected to because the sequence is not referred to by use of the sequence identifier, preceded by "SEQ ID NO:", in the text of the claim, as required by 37 CFR 1.821(d). Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-7, 9, 11, 14-15 and 20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The claims are drawn to a transgenic plant comprising any heterologous gene of unknown function from any unspecified marine vascular plant, including transgenic plants comprising any heterologous gene of unknown function from *Zostera marina*, any heterologous zosteric acid biosynthesis gene from any unspecified marine vascular plant, any heterologous saline-resistance gene from any unspecified marine vascular plant, any heterologous hypoxia-resistance gene from any unspecified marine vascular plant, and any nucleic acid from any source and of any sequence which hybridizes to SEQ ID NO:1 under conditions of unspecified stringency. The claims are also drawn to a transgenic plant comprising any heterologous nucleotide sequence encoding a zosteric acid biosynthetic function from any organism, including

any heterologous nucleotide sequence encoding a sulfotransferase activity, a transgenic plant comprising any heterologous nucleotide sequence encoding a saline-resistance function from any organism, and a transgenic plant comprising any heterologous nucleotide sequence encoding a saline-resistance function from any organism, and a transgenic plant possessing an antifouling genetic trait and transformed with a cDNA sequence obtained from a marine vascular plant that hybridizes to a nucleic acid encoding a sulfotransferase.

The specification describes the cloning from *Zostera marina* of a nucleotide sequence encoding a polypeptide having a moderate level of homology to known flavonol sulfotransferases, the *Zostera marina* nucleotide sequence being forth in Figure 4 (SEQ ID NO: 15) (pages 74-77). The specification also describes the cloning from *Zostera marina* of a partial cDNA sequence encoding a polypeptide having high homology to known alcohol dehydrogenases, a partial cDNA sequence encoding a polypeptide having high homology to known phenylalanine ammonia lyases, and a partial cDNA sequence encoding a polypeptide having homology to known cinnamate-4-hydroxylases (pages 78-79, figures 13, 15 and 17). The specification does not describe any other heterologous genes associated with any other function from any other marine vascular plant or from any other source.

The Federal Circuit has recently clarified the application of the written description requirement. The court stated that a written description of an invention "requires a precise definition, such as by structure, formula [or] chemical name, of the claimed subject matter sufficient to distinguish it from other materials." University of California v. Eli Lily and Co., 119 F.3d 1559, 1568; 43 USPQ2d 1398, 1406 (Fed. Cir. 1997). The court also concluded that "naming a type of material generally known to exist, in the absence of knowledge as to what that

material consists of, is not a description of that material." Id. Further, the court held that to adequately describe a claimed genus, Patent Owner must describe a representative number of the species of the claimed genus, and that one of skill in the art should be able to "visualize or recognize the identity of the members of the genus." Id.

Given the claim breadth and lack of guidance as discussed above, the specification fails to provide an adequate written description of the genus as broadly claimed. Given the lack of written description of the claimed product, any method of using it would also be inadequately described. Accordingly, one skilled in the art would not have recognized Applicants to have been in possession of the claimed invention at the time of filing. See Written Description Requirement guidelines published in Federal Register/ Vol. 66, No.4/ Friday January 5, 2001/Notices: pp. 1099-1111).

Claims 1-9, 11, 13-15 and 20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The claims are drawn to a transgenic plant comprising any heterologous gene of unknown function from any unspecified marine vascular plant, including transgenic plants comprising any heterologous gene of unknown function from *Zostera marina*, any heterologous zosteric acid biosynthesis gene from any unspecified marine vascular plant, any heterologous saline-resistance gene from any unspecified marine vascular plant, any heterologous hypoxia-resistance gene from any unspecified marine vascular plant, and any nucleic acid from any

source and of any sequence which hybridizes to SEQ ID NO:1 under conditions of unspecified stringency. The claims are also drawn to a transgenic plant comprising any heterologous nucleotide sequence encoding a zosteric acid biosynthetic function from any organism, including any heterologous nucleotide sequence encoding a sulfotransferase activity, including a nucleotide sequence comprising a sequence of at least 50 nucleotides of the sequence shown in Figure 4. The claims are also drawn to a transgenic plant comprising any heterologous nucleotide sequence encoding a saline-resistance function from any organism, and a transgenic plant comprising any heterologous nucleotide sequence encoding a saline-resistance function from any organism, and a transgenic plant possessing an antifouling genetic trait and transformed with a cDNA sequence obtained from a marine vascular plant that hybridizes to a nucleic acid encoding a sulfotransferase.

The specification discloses the cloning from *Zostera marina* of a nucleotide sequence encoding a polypeptide having a moderate level of homology to known flavonol sulfotransferases, the *Zostera marina* nucleotide sequence being forth in Figure 4 (SEQ ID NO: 15) (pages 74-77). The specification also discloses that the polypeptide encoded by the cloned nucleotide sequence has sulfotransferase activity (page 77). The specification additionally discloses the cloning from *Zostera marina* of a partial cDNA sequence encoding a polypeptide having high homology to known alcohol dehydrogenases, a partial cDNA sequence encoding a polypeptide having high homology to known phenylalanine ammonia lyases, and a partial cDNA sequence encoding a polypeptide having homology to known cinnamate-4-hydroxylases (pages 78-79, figures 13, 15 and 17). The specification does not teach how to make or use any other heterologous genes associated with any other function from any other marine vascular plant or

from any other source. Furthermore, the specification does not disclose the use of any of the *Zostera marina* nucleotide sequences in a transgenic plant, or the effect of expressing any nucleotide sequence in a transgenic plant on traits such as saline-resistance or hypoxia-resistance or antifouling.

Guidance for making and using the claimed invention is necessary because it is unpredictable whether expressing a heterologous nucleotide sequence, such as a heterologous nucleotide sequence encoding a sulfotransferase activity, in a transgenic plant would confer a useful trait, such as saline-resistance or hypoxia-resistance or antifouling. The ability of a heterologous nucleotide sequence to confer a useful trait on a transgenic plant is unpredictable because traits such as saline-resistance or hypoxia-resistance or antifouling are multigenic traits that require the presence and coordinated activity of multiple proteins. The expression of a single polypeptide encoded by a single heterologous nucleotide sequence may not affect a multigenic trait in a transgenic plant unless that polypeptide participates in a rate limiting step of the process that confers the trait.

The ability of a heterologous nucleotide sequence such as a heterologous nucleotide sequence encoding a sulfotransferase activity to confer a useful trait a transgenic plant is also unpredictable because the level of activity of any enzyme is dependent on the availability of specific molecules that positive and negatively regulate that enzyme's activity, which could vary within a species between cell types and between species. For example, Varin et al. teach that a number of different animal sulfotransferases have been identified that have specificity toward a variety of different metabolites including arylamines, phenols, steroids and bile acids (The Journal of Biological Chemistry, 25 January 1992, Vol. 267, No. 3, pages 1858-1863, see page

1858 column 2 first full paragraph). Varin et al. also teach that a number of different position specific plant flavonol sulfotransferases have been identified that exhibit strict specificity for position 3 of flavonol aglycones, position 3' or 4' of flavonol 3-sulfate, and position 7 of flavonol 3,3'- or 3,4'-disulfates (page 1858 column 2 second full paragraph). Varin et al. further teach that a plant sulfotransferase obtained from *Flaveria chloraefolia* is distinct from previously studied mammalian sulfotransferases which exhibit broad specificity toward major classes of substrates and none for a specific position (page 1861 column 1 first paragraph). Varin et al. additionally teach that the plant sulfotransferase obtained from *Flaveria chloraefolia* has dual pH optima at 6.0 and 8.5, and is inhibited at flavonol substrate concentrations above Km (page 1861 column 2 first full paragraph through column 2). Because different sulfotransferase enzymes require different substrates and reaction conditions in order to be biologically active, and because it is unknown which plant or plant cell types would provide the appropriate substrates and reaction conditions for a sulfotransferase enzyme to function in such a way as to cause saline-resistance or hypoxia-resistance or antifouling, the claimed invention is not enabled by the specification in the absence of further guidance or example.

Given the unpredictability of altering the phenotype of a plant by transforming it with a heterologous nucleotide sequence, such as a heterologous nucleotide sequence encoding a sulfotransferase activity, the absence of guidance in the specification for making and using a saline-resistant or hypoxia-resistant or antifouling transgenic plant by overexpressing in a plant a heterologous nucleotide sequence, such as a heterologous nucleotide sequence encoding a sulfotransferase activity, the lack of working examples, and given the breadth of the claims which encompass any transgenic plant transformed with any heterologous gene of unknown

function from any unspecified marine vascular plant, any heterologous zosteric acid biosynthesis gene from any unspecified marine vascular plant, any heterologous saline-resistance gene from any unspecified marine vascular plant, any heterologous hypoxia-resistance gene from any unspecified marine vascular plant, any heterologous nucleotide sequence encoding a zosteric acid biosynthetic function from any organism, any heterologous nucleotide sequence encoding a saline-resistance function from any organism, and any heterologous nucleotide sequence encoding a saline-resistance function from any organism, it would require undue experimentation by one skilled in the art to make and/or use the claimed invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 3, 4, 5 and 13-15, and claims dependent thereon, are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 3, 4 and 5 are indefinite in the recitation of "gene". The word gene implies DNA as it exists in nature, including coding and noncoding regions such as enhancers, promoters, and introns. It is suggested that the claim be amended to recite "heterologous polynucleotide" or " heterologous nucleic acid" or "heterologous nucleotide sequence" in order to overcome the rejection.

Claim 1 is indefinite in the recitation of "marine vascular plant". It is unclear what kind of plants the heterologous gene would be derived from, as "marine vascular plant" is not a specific taxonomic category. The phrase "marine vascular plant" would encompass any species of vascular plant growing in any marine-like environment, yet the specification discloses heterologous genes obtained from only one species of vascular plant, *Zostera marina*.

Claims 13-15 are indefinite in referring to SEQ ID NO:1 as a nucleic acid, as SEQ ID NO:1 in the sequence listing is an amino acid sequence.

***Claim Rejections - 35 USC § 101***

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 13-15 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 13-15 are drawn to a nucleic acid.

Claims 13-15, as written, do not sufficiently distinguish over nucleic acids as they exist naturally because the claims do not particularly point out any non-naturally occurring products. In the absence of the hand of man, the naturally occurring products are considered non-statutory subject matter. See Diamond v. Chakrabarty, 447 U.S. 303, 206 USPQ 193 (1980). The claims should be amended to indicate the hand of the inventor, e.g., by insertion of "Isolated" or "Purified".

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 3, 6, 7, 14, 15 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Varin et al. (Bulletin de Liaison - Groupe Polyphenols, 1992, Vol. 16, Part 2, pages 305-308).

Claims 1, 2 and 3 are drawn to a transgenic plant comprising any heterologous gene of unknown function "derived from" any unspecified marine vascular plant, including transgenic plants comprising any heterologous gene of unknown function from *Zostera marina*, and transgenic plants comprising any heterologous zosteric acid biosynthetic gene. Claims 6 and 7 are drawn to a transgenic plant comprising any heterologous nucleotide sequence encoding a zosteric acid biosynthetic function from any organism, including a sulfotransferase activity. Claims 14 and 15 are drawn to any nucleic acid from any source and of any sequence which hybridizes to SEQ ID NO:1 under conditions of unspecified stringency. Claim 20 is drawn to a transgenic plant comprising a cDNA "derived from" any unspecified marine vascular plant which hybridizes under conditions of unspecified stringency to a nucleic acid that encodes a sulfotransferase.

Varin et al. teach transgenic canola, potato and tobacco plants comprising a heterologous nucleotide sequence encoding a flavonol sulfotransferase from *Flaveria chloraefolia* (paragraph spanning pages 305-306; page 307 Figures 1 and 2). While Varin et al. do not teach the use of a

heterologous gene "derived from" a marine vascular plant wherein the vascular plant is *Zostera marina*, the phrases "derived from a marine vascular plant" and "wherein the vascular plant is *Zostera marina*" place no structural or functional limitations on the heterologous transgene of the transgenic plant, such that the claims read on any heterologous transgene encoding a zosteric acid biosynthetic function obtained from any source, or any sequence variant "derived from" the native *Zostera* gene. Furthermore, the ability of the *Flaveria* sulfotransferase gene to hybridize under low stringency conditions to the *Zostera* sulfotransferase gene would have been inherent.

Claims 1, 2, 4 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Xu et al. (Plant Physiology, 1996, Vol. 110, pages 249-257).

Claims 1 and 2 are drawn to a transgenic plant comprising any heterologous gene of unknown function "derived from" any unspecified marine vascular plant, including transgenic plants comprising any heterologous gene of unknown function from *Zostera marina*. Claim 4 is drawn to a transgenic plant comprising any heterologous saline-resistance gene from any unspecified marine vascular plant. Claim 9 is drawn to a transgenic plant comprising any heterologous nucleotide sequence encoding a saline-resistance function from any organism.

Xu et al. teach a transgenic rice plant comprising a heterologous nucleotide sequence encoding a HVA1 saline-resistance function from barley (page 254 Table III; page 255 Table V). While Xu et al. do not teach the use of a heterologous gene derived from a marine vascular plant wherein the vascular plant is *Zostera marina*, the phrases "derived from a marine vascular plant" and "wherein the vascular plant is *Zostera marina*" place no structural or functional limitations on the heterologous transgene of the transgenic plant, such that the claims read on any

heterologous saline-resistance transgene obtained from any source, or any sequence variant "derived from" the native *Zostera* gene.

Claims 1, 2, 5 and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Hoeren et al. (Genetics, June 1998, Vol. 149, pages 479-490).

Claims 1 and 2 are drawn to a transgenic plant comprising any heterologous gene of unknown function "derived from" any unspecified marine vascular plant, including transgenic plants comprising any heterologous gene of unknown function from *Zostera marina*. Claim 5 is drawn to a transgenic plant comprising any heterologous hypoxia-resistance gene from any unspecified marine vascular plant. Claim 11 is drawn to a transgenic plant comprising any heterologous nucleotide sequence encoding a hypoxia-resistance function from any organism.

Hoeren et al. teach transgenic pea plants comprising a heterologous nucleotide sequence encoding an AtMYB2 hypoxia-resistance function from *Arabidopsis* (page 485 Figure 5). While Hoeren et al. do not teach the use of a heterologous gene derived from a marine vascular plant wherein the vascular plant is *Zostera marina*, the phrases "derived from a marine vascular plant" and "wherein the vascular plant is *Zostera marina*" place no structural or functional limitations on the heterologous transgene of the transgenic plant, such that the claims read on any heterologous hypoxia-resistance transgene obtained from any source, or any sequence variant "derived from" the native *Zostera* gene.

***Remarks***

No claim is allowed.

Claims 8 and 13 are deemed free of the prior art due to the failure of the prior art to teach or suggest a nucleic acid comprising at least 50 nucleotides of SEQ ID NO:1, or a transgenic plant comprising a heterologous nucleotide sequence comprising at least 50 nucleotides of the sequence shown in Figure 4 (SEQ ID NO:15).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cynthia Collins whose telephone number is (703) 605-1210. The examiner can normally be reached on Monday-Friday 8:45 AM -5:15 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amy Nelson can be reached on (703) 306-3218. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-4242 for regular communications and (703) 308-4242 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0196.

CC
June 12, 2003

DAVID T. FOX
PRIMARY EXAMINER
GROUP ~~180~~ 1638